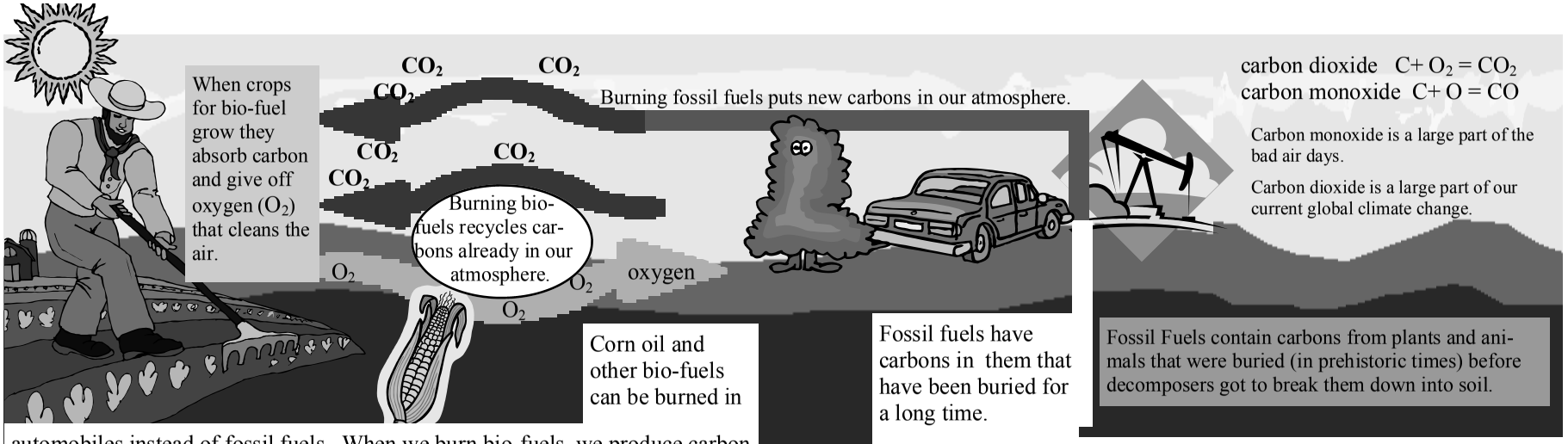
Muscle powered transport produces little to no carbon dioxide.

Motor powered transport emits carbons into the atmosphere.

When burning bio-diesel in our motors, we recycle carbons already in the atmosphere.

When burning fossil fuels, we release carbons that haven't been in the atmosphere since pre-historic time.



automobiles instead of fossil fuels. When we burn bio-fuels, we produce carbon monoxide and carbon dioxide too, but we're releasing carbons that were already in our atmosphere and captured in the plants. We are recycling the carbons instead of digging up new ones.

When we burn fossil fuels, we release carbons that our atmosphere isn't used to. As the atmosphere changes from extra carbons, so does our climate. We also find it harder to breathe the air.

1) Seed grown on seed farms shipped to seed company.

2) From seed company to farm or garden….

3)...and grown into seed.
(transporting growing supplies to the farm)

4) Foods grown are shipped to a packaging plant…..

5)...then to a distributor

6)…..then to a market.

7) Then we took a trip to the store to buy our food.

8) Then we ate it. And it was good!

Contest!!! **for stories and pictures about how we use energy and where we get it**

In the past issues of the Green Schools News, we've illustrated the path of the sun's energy through food, to give us the energy to work, grow, learn and play. We've also traced the path of the sun's energy to make electricity to make our homes warm and bright. This fall, we'd like you to send us your illustrations of how your food gets to your dinner table.

Draw pictures and/ or a story that represents some (or all) of the boxes shown above, or create your own story about how your food got to your table. Send entries to PO Box 728 Parsonsfield, ME 04047 by 12/20/01

We welcome too, stories and/ or pictures that tell the story of how:

*the sun goes through food to help us grow, play, work and learn. (GSNEWS VOL.1 issue 1 Autumn 2000). Send entries to above address by 3/21/01.

*the sun's energy generates electricity to make our homes warm and bright .(GSNEWS VOL.1 issue 1 Autumn 2000). Send entries to above address by 6/21/01.

First prize: 8 twister compact fluorescent light bulbs.
Second prize: 6 twister compact fluorescent light bulbs.
Third prize: 4 twister compact fluorescent light bulbs.

Stories and pictures will be showcased at next fall's Green Schools workshops!

FOOTPRINTS: Measuring the ecological impact of our lives

What is an Ecological Footprint?

When we think of trackers reading a trail of prints, the track, or "footprint" is evidence of what animals have passed, what they were doing, and when. An **Ecological Footprint** is a measure of what we humans leave behind while living our lives.

Measuring *Ecological* Footprints, we measure the amount of land it takes to support our lifestyle. We measure the land it takes to grow and transport our food to our dinner table, the land it takes to fuel our electricity and transportation demands, the land it takes to absorb the carbon dioxide we emit, and the land it takes to build our homes and keep them warm and bright.

Ecological Footprints' Links to Social and Environmental Justice

Environmental and Social Justice are measures of how fair things are. Environmental justice measures how fairly humans treat other living creatures. Social justice measures how fairly humans treat each other. If we want to use only our fair share of energy and land, leaving enough habitat for the wild animals and plants that make this earth such an extraordinary place to live, we can find ways to make our ecological footprints small enough to use only our "fair share". Our fair share is the 15 point footprint (about 4 acres) used in this activity. (see pg. 4 for details on how this is determined.)

What does our energy use have to do with justice?

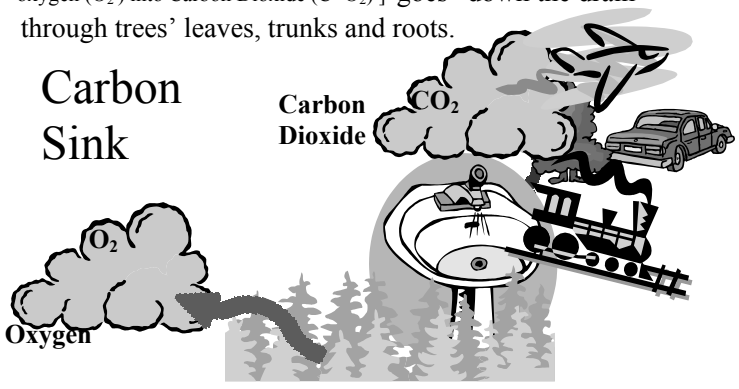
Our energy comes from the sun. From the food that the sun grows we derive the energy to play, work and grow. As humans have become civilized, we've learned to harness other sources of energy too. Harnessing the heat energy of fire enabled humans to keep warm in winters. Harnessing the mechanical energy of wind and water allowed humans to move down rivers and sail vast oceans. Harnessing the mechanical energy of slaves and work animals granted non-slaves the privilege of eating foods they didn't "work" for. Harnessing the chemical energy of fossil fuels presented opportunities for engines and machines to do the work often done by animals and slaves.

No matter how we get the energy we consume, there is a cost. If we grow all of our own food and walk everywhere we want to go, we have less time for play. If we have slaves do our work, we must live with the very high cost of injustice. If we have animals do our work, we must work hard to keep the animals happy and healthy. If we have fossil fuels do our work, the pollution produced hurts all living things. If we have wind, hydro-electric, geothermal energy and solar electricity do our work, we must work to redesign, re –think and re-evaluate how we generate and use our energy systems.

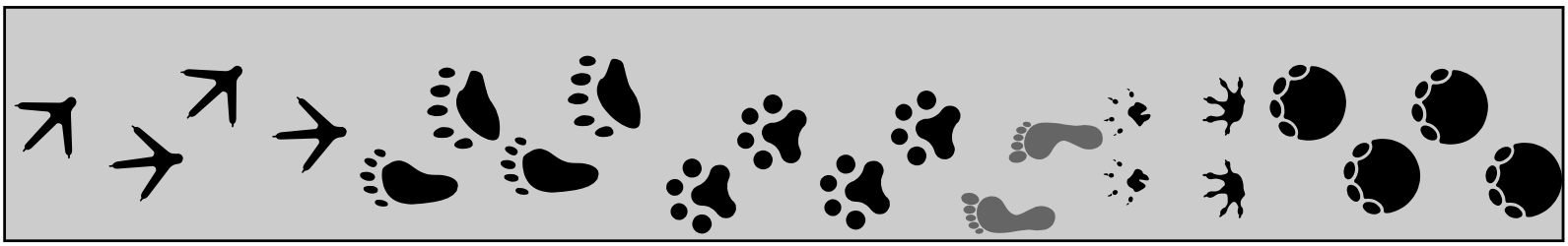
Measuring your ecological footprint and learning how its size changes as your lifestyle choices change is a great *start* towards understanding the impacts of your energy choices. We hope this exercise will inspire you to find ways to leave smaller ecological footprints in your life-style, and more room for the footprints of wild creatures and open spaces that keep the human spirit (and

How do I measure my Ecological Footprint?

In this exercise, we'll measure the ecological footprint of our transportation choices. When we burn fuels to move our bodies and stuff around in planes, trains and automobiles, a great deal of carbon dioxide is given off. This carbon dioxide (also called CO_2) is something that all of us produce while breathing, but burning fossil fuels produces so much that it is changing climates and weather patterns. Trees and plants absorb some of this CO_2, so measuring the area of trees it takes to absorb this CO_2 is a useful way to measure the impact of using fossil fuels. Because forests absorb carbon dioxide they are sometimes called *carbon sinks,* giving us the impression that the carbon [that turns oxygen (O_2) into Carbon Dioxide ($C+O_2$)] goes "down the drain" through trees' leaves, trunks and roots.



It is important to remember that we can't actually plant enough trees to absorb all the CO_2 that our cars and power plants are generating (we'd need four times the trees we have now, and there isn't enough land to plant all those trees), but measuring our energy use by measuring the carbon sinks we'd need gives us a sense of how much space our energy use is consuming.



Your Transportation Impacts

To measure the size of land it takes to meet your transportation needs, you'll need to keep track of what kinds of transportation you use and what distances you travel. For one week, keep a journal of every time you travel, how you travel and how far you go.

For Muscle Powered Transportation:

1) For one week, every time you travel by bike, foot, skis, horse, snowshoe, dog sled, ice skates, skateboard, canoe….etc. record how you traveled and how long you were traveling.

2) At the end of one week, add the times for each kind of travel and find your transportation points using the chart on page 3.

For Fossil Fueled Transportation:

1) Record the odometer number on each household car at the beginning of the week.

2) Each day of the week, write how much time the drivers in your family spent driving.

3) At the end of one week, record the odometer of each car and find your transportation points using the chart on page 3.

3) Each time during the week that you travel by train, bus or taxi, record how many miles you travel, and how long you travel. Each time you travel by plane, record how long you travel.

To determine your "transportation footprint" use the worksheet on page 3 and 4. Then, fill in the footprint on page 4 with points.

What did you learn about your transportation impacts?

How does your transportation footprint compare to your classmates?

How would your transportation footprint change if you:
Changed to a different transportation method?
Changed your diet?
Reduced the trips you take by planning your errands?

Repeat this exercise with these changes to learn how it might impact the size of your footprint.

Extensions

Figure out the land impact for each switch in your classroom, and record that # on your switch plate reminders (see bottom of insert pg. 4).

Fossil Fueled Transportation Points

Table 1

Transportation	Forest sink	Built up	Total
Car 10 miles (15 mpg)	8.40	1.62	10.2
@ (25 mpg)	5.04	.97	6.01
@ (35 mpg)	3.60	.69	4.29
Hybrid electric @ (55 mpg)	2.29	.44	2.73
Hybrid electric @ (65 mpg)	1.94	.37	2.31
Electric car	1.68	.32	2.00
Taxi (10 miles)	4.08	.78	4.86
Train or Bus (10 miles)	1.02	.31	1.33
Snowmobiles (10 miles)	12.6	.25	12.85
Plane (per hour)	162		162

Muscle Powered Transportation Points

Farm and Field points fueled by	meat/dairy diet	vegetarian diet
Walking on loose snow	8.36	1.44
Walking on level ground	1.93	.33
Walking on level ground carrying 22 lbs.	2.061	.35
Walking on 10% incline	5.28	.91
Walking on 10% incline carrying 22 lbs.	6.31	1.09
Walking on 20% incline	8.24	1.42
Walking on 20% incline carrying 22 lbs.	10.3	1.78
Running	11.72	2.02
Hiking (light load and slope)	10.5	2.04
Hiking (heavy load and slope)	15.1	2.59
Canoeing 2.5 mph	3.86	.66
Canoeing 4.5 mph	7.01	1.22
Sailing	5.79	.99
Cycling 5.5 mph	3.86	.66
Cycling 9.4 mph	7.08	1.22
Ice Skating	7.08	1.22
Snowshoeing on level ground	9.33	1.61
Snowshoeing 10% incline	13.10	2.53
Skiing on level ground	10.82	1.86
Skiing uphill	22.02	3.79
Dog Sledding sm. team (human)	8.37	1.44
Dog Sledding sm. team (dogs)	10	
Dog Sledding lg. team (human)	4.5	.61
Dog Sledding lg. team (dogs)	15	
Horseback Riding (walk) human energy	1.67	.22
Horseback Riding (walk) horse energy		1
Horseback Riding (trot) human energy	7.22	1.5
Horseback Riding (trot) horse energy		1.5
Piloting a plane	.11	.01
Driving a car	1.44	.19

From the journal of transportation you kept, fill in these worksheets for muscle powered transport and fossil fueled transport. Then fill in page 4's footprint to compare your land use to that of others.

For muscle powered transportation:

- Under type of transportation, list each kind of muscle powered transportation you used to get you and your stuff around.
- In the box to the right, put the total amount of time (in hours) you spent using that kind of transportation.
- In the chart on page 2, look to see how many land points that kind of transportation uses per hour to fill in the points box. (Notice the points depend on what kind of diet you eat).
- Now multiply those two numbers together to get your points per week .
- Divide that number by 7 to get your daily average of points.
- Repeat this for each type of muscle transportation you used, and remember, if the muscles were a horse's or a dog's, you must put in points for the animal(s) as well as for their passenger.
- Once all muscle powered transportation is entered, enter too the total time the drivers in your family spent driving this week. Figure these points the same way, as it is the muscle powered part of automobile transportation.
- When you've figured all of your muscle powered transportation, add the numbers in the right hand column together. Their sum is your total footprint for muscle powered transportation.

The kcalorie demands of exercise and kcalorie supplies of food used to make these equations came from Nutrition and Physical Fitness by Jean Bogert, George Briggs and Doris Calloway published in 1972 by W.B. Saunders Company.

Type of transportation	# of hours for week		land points per hour		points per week	divided by seven days		average points
Walking	7 hours	X	1.09	=	7.63	÷ 7	=	1.09
Skiing uphill	1 hour	X	3.79	=	3.79	÷ 7	=	.54
Horseback Riding (trot)	3 hours	X	1.5 +1.5 (3)	=	9	÷ 7	=	1.29
Driving	10 hours	X	.19	=	1.9	÷ 7	=	.20
For horseback riding (as with dog sledding) I have to add the energy it takes me to ride the horse, as well as the energy the horse needs to carry me. Because I eat a vegetarian diet (as does the horse) the points for each of our energy needs is 1.5 points for every hour of riding at a trot. You'd think it would take more land to feed the horse than me, wouldn't you? But it takes a lot of land to produce and transport the food eaten by humans, whereas horses may eat hay right where it grows, without being transported, processed or cooked like most human foods are, so while they eat more, it takes less land to produce their food.								
Weekly Land Points	To find your footprint for muscle powered transportation, add the right columns together.							3.19

The food points for muscle powered transport only represent the foods needed to support the caloric demands of exercise and don't represent the daily requirements.

For fossil fueled transportation (see worksheet on reverse):

- List the types of vehicles that moved you and your stuff around.
- Next to each box that is a car, record what their mpg (miles per gallon) is.
- Record the odometer reading that you ended with followed by the reading you began with.
- Subtract these numbers to find the mileage for the week. (If you have traveled by taxi, bus or train, simply record the total number of miles traveled. Put this number in the mileage for week column.)
- Divide this number by 10.
- From the chart on page 2, find the points for this type of transportation and record this in the transport point box.
- Now multiply by the point units to get your weekly points.
- Next, divide by 7 to get your daily points.
- Do this for each vehicle , then add up the right hand column to find your fossil fueled transportation points.
- Adding these points to your muscle powered points will give you the total points for your transportation footprint.

Car	MPG	Odometer at end of week		Odometer at start of week		Mileage for week			Point units		Transport points		Weekly points			Daily points
Pick up	15	125,588	-	125,388	=	200	÷ 10	=	20	X	10.02	=	204	÷ 7	=	29.14
Hybrid	65	5100	-	4900	=	200	÷ 10	=	20	X	2.31	=	46.2	÷ 7	=	6.6
Train			-		=	200	÷ 10	=	20	X	1.33	=	26.6	÷ 7	=	3.8
			-				÷ 10	=		X		=		÷ 7	=	

The footprint calculations are based on results from the footprint calculator found at http://www.rprogress.org/progsum/nip/ef/ef_main.html. Data on US vs. India footprints from Wackernagel and Rees' book: Our Ecological Footprint: Reducing Human Impact on the Earth.

1 point is 1/4 of an acre.

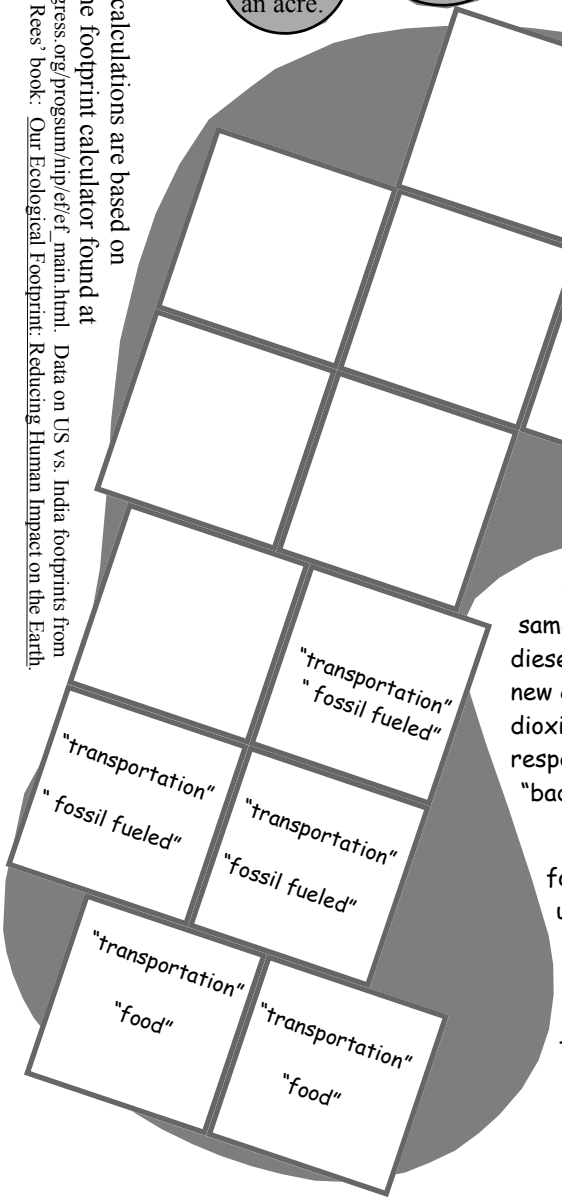
Do this activity from last year's

Green Schools News (Autumn and Spring).

With your footprints from these activities, compare the impacts

of your food choices your, lighting, electricity, your lighting choices and your transportation choices. Which has the largest impact?

1 point is the size of a square with one inch sides, (or once square inch).



Once you've figured out how many land points your transportation footprint used, cut out one square for each point used (see above). Label all points "transportation". Below this, label the points fueled by muscle: "food". Label those transported by petroleum: "fossil fueled".

*Note: if you've used bio-fuel to power an automobile, use the same number of points as you would for fossil fuel powered cars, but instead of "fossil fueled", label the points "food". Some folks think that using bio-diesel isn't any better than fossil fuel because it uses the same amount of land, but because it uses land to grow food (food's made into bio-diesel). Growing food keeps recycling our carbon, while digging up fossil fuel puts new carbon into our atmosphere. This extra carbon is responsible for the carbon dioxide that's responsible for our global climate change. This extra carbon is also responsible for the carbon monoxide that creates high ozone responsible for our "bad air days". For an illustration of this carbon cycle, see the insert.

This cluster of 15 squares represents the amount of usable land evenly divided for each person on the planet (1.5 hectares or just under 4 acres). If we're using more than one footprint's worth of land to meet our needs, we're using someone else's fair share. The ecological foot print of people who live in India, for all their needs: food, clothing, transportation & electricity is an average of 4 points (less than 1/4 of a footprint!). US Americans' average ecological footprint is 50 points! (more than 3 whole foot prints!).